Chapter 6
From Humans to Humans:
Designing Human-Centered AI for Better Healthcare

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ABSTRACT

Artificial intelligence (AI) is transforming healthcare through advancements in service platforms, decision-making processes, and biomedical technologies, while adhering to humanistic principles. In the era of digital transformation and Healthcare 4.0, this chapter examines how AI algorithms enable systems to learn from human inputs and collaborate with professionals to deliver accurate and efficient care. Adopting a qualitative approach, this chapter provides comprehensive literature reviews and explores in-depth case studies, including AIDI, the AI-powered service platform enhancing patient experiences and hospital operations; SepsisLab, improving diagnoses and decision-making through AI-human collaboration; and BrainGate and Neuralink, the state-of-the-art brain-computer interfaces aiding neural communication and autonomous movement. Potential ethical issues are also addressed. Ultimately, the chapter advocates for AI's evolution from being purely designed by humans to more human-centered solutions, where AI revolutionizes healthcare and contributes to a promising future.

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1. INTRODUCTION TO ARTIFICIAL INTELLIGENCE IN HEALTHCARE

Artificial Intelligence (AI) has been generally defined by academia as systems that mimic human's cognitive functions in learning, speech, and problem-solving (Russell & Norvig, 2016). A more detailed elaboration explains that AI possesses the capability of independently interpreting and learning from external data to achieve specific outcomes through flexible adaptation, which usually involves utilizing big data to design algorithms to deliver excellent performance for specific tasks and displays a more pragmatic trend of effectively translating human thoughts and emotions (Dwivedi et al., 2021).

What is noteworthy is that AI is not an isolated technology but rather a spectrum of algorithms and functionalities processed and generated by machines and computers (Chen & Decary, 2020). AI is closely associated with machine learning, natural language processing (NLP), voice technology, assistants, and chatbots. Among them, machine learning along with its subfield deep learning, the most prevailing method in AI fields, entails a system training a predictive model by discerning primarily data patterns from inputs, subsequently utilizing this model to generalize their judgment to new observations (Barbierato & Gatti, 2024). The capability of machine learning epitomizes the essence of AI by autonomously studying from experience and making enhancements without explicit programming, which display extensive applications and interactions across various other AI domains as well, such as NLP, AI voice technology, and AI chatbots. Natural language processing (NLP), usually relying on machine learning, refers to the interplay between computers and humans through the utilization of natural language, focusing on the computer's capacity to deprive meaning from human language in an AI discipline (Sun et al., 2020). Coupled with those capabilities mentioned above, AI, encompassing a sophisticated and interactive system, has become a powerful solution to many real-world problems, including the AI-based human-centered healthcare, which is the subject of this chapter.

2. HUMAN-CENTERED AI AND ITS THREE DIMENSIONS TO BOOST HEALTHCARE

With significant shifts brought by AI in many sectors of human life, the field of healthcare also benefits from this increasingly advanced and human-centered intricacy. It is reported by Shaban-Nejad et al. (2022) that since the onset of COVID-19 pandemic, AI tools and technologies have displayed an important role in the healthcare area, including but not limited to "disease surveillance, screening, diagnostics, case detection, prediction, risk stratification, drug and vaccine development, resource

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